

Joan K. Leavitt, M.D.  
Commissioner

OKLAHOMA STATE  
DEPARTMENT OF HEALTH

P.O. BOX 53551  
1000 NE TENTH  
OKLAHOMA CITY, OK 73152



**Board of Health**

Walter Scott Mason, III  
President  
Ernest D. Martin, R.Ph.  
Vice President  
Wallace Byrd, M.D.  
Secretary-Treasurer

John B. Carmichael, D.D.S.  
Jodie L. Edge, M.D.  
Dan H. Fieker, D.O.  
Burdge F. Green, M.D.  
Linda M. Johnson, M.D.  
Lee W. Paden

AN EQUAL OPPORTUNITY EMPLOYER

Work Plan for Sooner Dial Company Site  
Clinton, Oklahoma

INTRODUCTION

In brief summary, this site, near downtown Clinton, is the former location of an aircraft instrument refinishing operation which operated under the name of Sooner Dial Company. In the process of refurbishing these instruments, a mixture of radium and a paint containing a phosphor activated by the alpha particles emitted by the radium was applied to the instrument dials. The process of removing the old radium/paint mixture and the application of new paint created substantial amounts of radium-contaminated waste. Some of the waste was in the form of a slurry while some was in the form of very small pieces of metal or hardened paint. Generally, the handling, storage, and disposal of such waste usually did not even approach the measures which would be taken today in a similar situation.

Thus, it is not surprising to find significant radium contamination at this site as a result of the operations carried out there in the past by Sooner Dial Company.

Purpose of this Plan

1. To describe in some detail a plan for determining the scope and extent of the radium contamination at this site and any which exists in adjoining or nearby areas.
2. To the extent that decontamination activities may occur in conjunction with site assessment, to describe in general terms the activities which will (or may) be necessary in order to decontaminate the site to a level suitable for unrestricted use.

Site Assessment Plan

1. Establish a grid system with 5-meter-square grids over the entire Sooner Dial site exclusive of the auto shop building on the north side of the site. The grid system should cover the easements, the alley, and any other publicly-owned strips of land abutting the site. The grid system should be marked with stakes or flags or in some other appropriate fashion; the grid should be displayed on a scale drawing of the site as well.

9527421



2. Using the grid system as a guide, survey and record the gamma radiation levels at the surface and at a height of 1 meter above the surface at each corner established by the grid. Isopleths of the gamma levels found should be created on the scale drawing of the site.
3. For those locations exceeding a pre-determined level - 5 times background, for example - additional, more detailed surveys should be conducted, and the data collected recorded for use in the assessment.
4. Core samples from holes at selected locations, based on the data from #2 and 3 above, should be collected and analyzed for radium content. Coring should be to a minimum depth of 6 feet with each 6-inch segment analyzed separately. If the initial core samples indicate extensive radium contamination of soil more than 6 inches below the surface, additional coring should be considered for the purpose of more accurately assessing the site.
5. Using some written protocol which assures completeness of the survey, the buildings and concrete slab on the north side of the site should be surveyed.
6. To the extent to which owners' permission can be obtained, survey the private property immediately to the west of the alley behind the site and the building immediately south of the site and any open ground or parking lots associated with this building. These surveys should be conducted in a manner consistent with the procedures adopted for use in #1, 2, 3, and 5 above.
7. Without intruding on private property, survey the neighborhood of the site at a radius of about 2 - 3 city blocks in all directions. The survey locations should be selected to be representative of the area being surveyed; these locations should be described and recorded for future reference.
8. For the "south" site (a lot about 2 miles south of the Sooner Dial site to which building material debris from the Sooner Dial site had been taken several years ago), a gamma survey of sufficient detail should be conducted to determine any areas where the gamma level at 1 meter above the surface exceeds a pre-determined value. Any such areas identified should be plotted on a scale drawing of the south site. If preliminary surveys indicate extensive contamination due to Sooner Dial site debris, further surveys should be done, and soil samples from appropriate areas should be taken for analyses.
9. Based on the data collected as a result of the activities described in items #1 through 8 and in consideration of decontamination guidelines for radium, a site assessment document should be prepared which contains the following information:

- a. projected length of time to complete decontamination and clean-up activities;
- b. unusual contingencies which do or may exist which would affect decontamination and clean-up activities;
- c. estimated resource requirements in terms of personnel, tools, radiation detection equipment, radiochemistry laboratory services, heavy equipment such as trucks, expendable supplies, and waste disposal services for waste removed from the site; and
- d. estimated costs associated with the decontamination and clean-up.

Decontamination/Clean-up Activities

- 10. Based on the information known at this time, and with consideration of good health physics practice in regard to radium contamination, the following activities are expected to occur as a result of efforts to decontaminate and clean-up so that the Sooner Dial site and, as necessary, the south site are left in a finished state for unrestricted release:
  - a. extensive moving, excavation, or disturbance of surface and sub-surface soil;
  - b. categorization of radium contamination in disturbed soil based on either field surveys for gamma or laboratory analyses or both;
  - c. separation of the categorized soils into piles or distinct areas;
  - d. excavation of buried radium-rich shop waste, if present, and packaging of such waste into suitable containers;
  - e. packaging of highly-contaminated soil into suitable containers and shipment of this waste as well as that mentioned in 10(d) and 10(h) to a low-level radioactive waste (LLW) broker or direct to a LLW disposal site;
  - f. replacement of slightly-to-moderately contaminated soil on the site, preferably in a fashion so that it is no longer at the surface;
  - g. acquisition and placement of fresh, non-contaminated soil on the site surface to restore site topography and to facilitate seeding with grass or other vegetation;
  - h. removal of any radium found to be above guidelines on building structures such as floors or walls;

- i. necessary activities to respond to inquiries from local residents or from the news media;
- j. those routine health physics activities necessary to provide proper personnel protection to workers and to assure the safety of the general public, especially passers-by and neighborhood residents; and
- k. any activities arising from the need to cope with any unanticipated or extraordinary occurrence during this clean-up process.

Equipment and Services

11. The grid system should be established using recognized land surveyor methods.
12. The radiation detection equipment necessary to accomplish the activities mentioned in #2, 3, 5, 6, 7, 8, 10(b), 10(h), 10(j), and 10(k) must be of the type normally referred to as "micro-R meters" and capable of measuring gamma radiation at levels ranging from 1 micro-Roentgen per hour ( $\mu\text{R/hr}$ ) to several thousand  $\mu\text{R/hr}$ . The normal gamma background in Clinton, but not on the site, is about 8  $\mu\text{R/hr}$  as determined by such an instrument.
13. In addition, portable radiation detection instruments capable of detecting gamma, beta, and alpha radiation must be available for use at the site. Activities mentioned in #5, 6, and 10(j) are likely uses of such instrumentation.
14. Personal and area air samplers and dosimeters will be required to meet the scope of 10(j).
15. Other personal protective equipment which may be required include respirators, goggles, gloves, hard hats, and work shoes or boots.
16. The radiochemistry laboratory used must be able to analyze soil samples for radium (reported in units of picoCuries per gram, dry weight) using procedures which allow for consistency in counting geometry and detector efficiency. The laboratory must be capable of conducting gross alpha/gross beta and/or radium analyses on materials deposited on paper

Work Plan for Sooner Dial Company Site  
Clinton, Oklahoma  
Page Five

filters, reported in units of net counts per minute with a counting efficiency factor or in disintegrations per minute. The laboratory should have the capacity of performing analyses for gross alpha, gross beta, or radium on samples of differing media.

Prepared by:

Dale McHard, Chief Environmental Engineer  
Radiation Protection Division

DMc/mj

Jeth Red returned by Mr. Gutf  
to determine \$ cost of clean up

Dm<sup>c</sup> needs to find N.J. materials  
needs to review N.J. materials  
then needs to xerox appropriate  
materials to Jeth Red  
(above re radium removal & clean up  
procedures, in particular)

Summary of meeting -

1. what about surfacing/covering over?
2. Clinton to hire H.P.?
3. OSDA to fence site > per 1985 news article
4. public hearing/public meeting
5. release limits
6. to core or not
7. lab facilities
8. public relations/public perceptions

~~\$2200~~ \$32/ft<sup>3</sup> EnviroCore

$$32 \times 7.5 = 225 \times 80 = \$16K$$

2K

$$80 \rightarrow \$2200$$

Building

Auto Shop  
(Garage)

Concrete

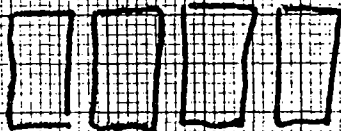
812

50 yd area line

811  
50-100 yd

Grass

Parking



Cars

Grass/gravel/pavement

Parking

Street

Scale = 1 sq = 1 ft







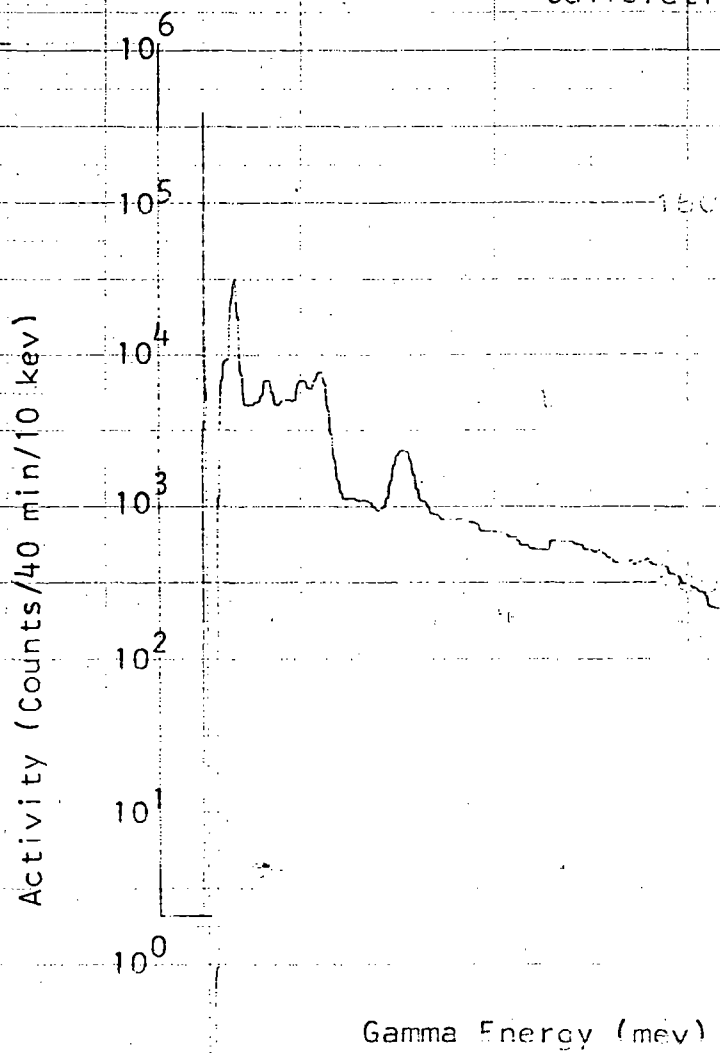
Sooner Dial Company  
Clinton, Oklahoma

Wipe No. 1

Live Time: 40 min

Background not subtracted

Calibration: 10 kev/channel



200004000	000000	000000	001043	001532	001767	001898	001724	001343	001019
210000790	000617	000444	000343	000310	000247	000213	000176	000195	000152
220000152	000161	000139	000150	000137	000132	000129	000106	000118	000109
230000084	000100	000092	000106	000087	000100	000066	000070	000081	000068
240000067	000064	000068	000057	000052	000066	000076	000059	000079	000079
250000062	000058	000049	000053	000040	000044	000048	000047	000048	000051
260000043	000044	000034	000030	000042	000035	000038	000036	000046	000034
270000036	000042	000041	000031	000029	000028	000040	000032	000033	000035
280000032	000033	000034	000028	000029	000035	000028	000029	000030	000028
290000023	000026	000028	000023	000040	000029	000032	000024	000026	000030
300000026	000024	000023	000023	000026	000024	000028	000028	000020	000035
310000023	000015	000022	000020	000023	000018	000018	000016	000015	000025
320000015	000016	000014	000019	000015	000013	000016	000013	000013	000011
330000010	000017	000015	000014	000012	000013	000014	000020	000022	000020
340000014	000021	000017	000015	000011	000014	000012	000009	000007	000008
350000010	000012	000008	000007	000014	000010	000005	000004	000007	000004
360000005	000005	000007	000002	000003	000010	000008	000002	000004	000003
370000004	000001	000001	000002	000006	000004	000001	000005	000002	000007
380000002	000004	000003	000000	000002	000003	000004	000001	000004	000003
390000005	000004	000003	000002	000004	000000	000003	000004	000001	000007

9301

200004000	000000	000000	000002	000053	000247	000350	000345	000674	000693
210000426	000272	000238	000219	000258	000272	000251	000304	000303	000289
220000287	000225	000241	000228	000252	000238	000236	000214	000240	000247
230000225	000196	000186	000228	000235	000212	000188	000139	000133	000112
240000077	000088	000072	000077	000072	000076	000064	000076	000095	000076
250000075	000073	000065	000076	000072	000069	000071	000103	000083	000102
260000096	000076	000058	000065	000060	000046	000044	000044	000054	000047
270000043	000045	000048	000053	000041	000049	000047	000045	000041	000051
280000036	000035	000032	000044	000029	000044	000034	000040	000046	000044
290000043	000044	000040	000032	000036	000038	000038	000036	000029	000032
300000037	000032	000030	000030	000035	000031	000033	000032	000034	000027
310000020	000025	000017	000038	000038	000027	000018	000028	000025	000025
320000027	000018	000014	000013	000025	000024	000019	000026	000020	000019
330000012	000015	000025	000012	000019	000017	000019	000017	000018	000018
340000015	000018	000022	000028	000027	000017	000011	000015	000010	000013
350000011	000010	000009	000008	000013	000013	000009	000011	000013	000007
360000009	000009	000010	000008	000008	000010	000008	000006	000006	000012
370000005	000007	000009	000015	000007	000005	000008	000005	000006	000006
380000004	000001	000005	000005	000003	000005	000004	000003	000003	000007
390000000	000007	000000	000006	000000	000005	000003	000003	000003	000002

11931

2630

460 dpm

200000000	000000	000000	000002	000102	000480	000644	000677	001480	001579
2100000766	000405	000347	000364	000395	000386	000391	000411	000525	000497
2200000252	000347	000362	000399	000398	000324	000316	000357	000478	000422
2300000380	000342	000371	000428	000410	000386	000325	000225	000177	000131
2400000142	000130	000111	000103	000098	000101	000085	000121	000091	000102
2500000108	000129	000087	000088	000103	000119	000126	000152	000159	000178
2600000164	000144	000110	000114	000084	000075	000079	000065	000063	000067
2700000073	000084	000060	000075	000076	000065	000071	000057	000066	000070
2800000056	000062	000062	000059	000066	000059	000076	000052	000052	000059
2900000050	000070	000050	000044	000057	000055	000041	000039	000049	000043
3000000050	000045	000046	000037	000049	000051	000051	000044	000049	000052
3100000046	000023	000045	000037	000041	000041	000043	000044	000032	000025
3200000046	000026	000030	000026	000035	000033	000035	000035	000034	000021
3300000031	000042	000024	000032	000029	000032	000029	000030	000031	000021
3400000029	000040	000032	000024	000040	000018	000025	000018	000018	000015
3500000022	000022	000017	000013	000018	000010	000018	000013	000019	000012
3600000016	000019	000017	000016	000017	000017	000023	000026	000017	000018
3700000014	000010	000018	000010	000013	000004	000007	000011	000009	000007
3800000009	000008	000011	000007	000009	000011	000005	000011	000011	000010
3900000005	000008	000006	000008	000007	000004	000004	000007	000005	000001

18,964

9663

1691 dpm

41

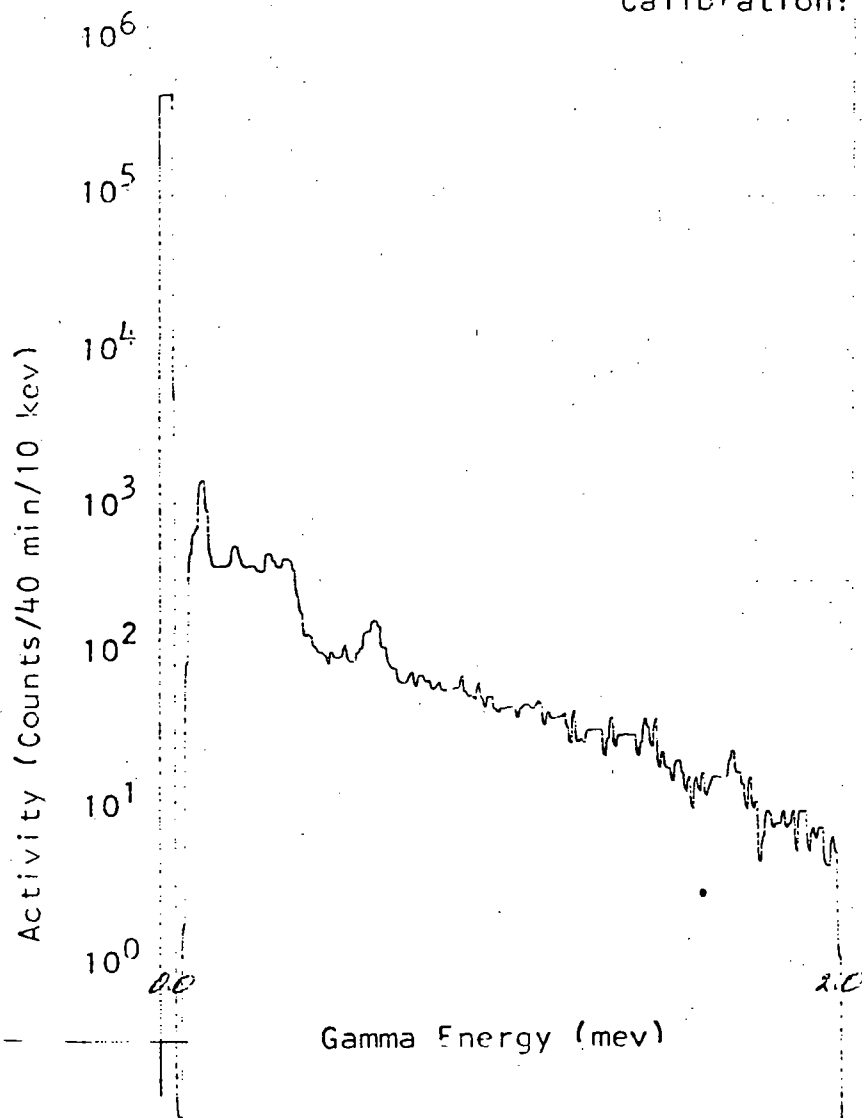
Sooner Dial Company  
Clinton, Oklahoma

Wipe No. 5

Live Time: 40 min.

Background not subtracted

Calibration: 10 kev/channel



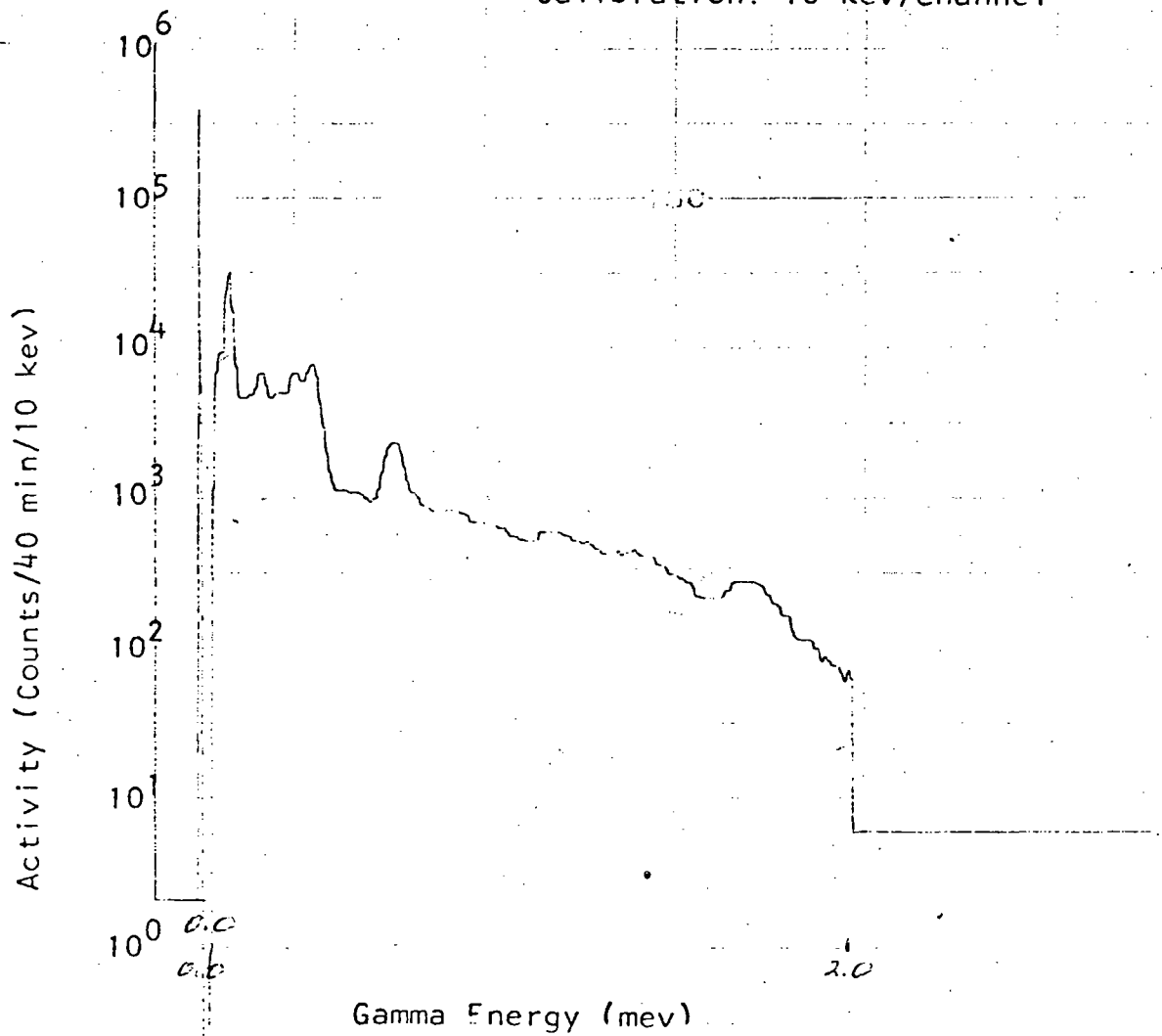
Sooner Dial Company  
Clinton, Oklahoma

Wipe No. 1

Live Time: 40 min

Background not subtracted

Calibration: 10 kev/channel



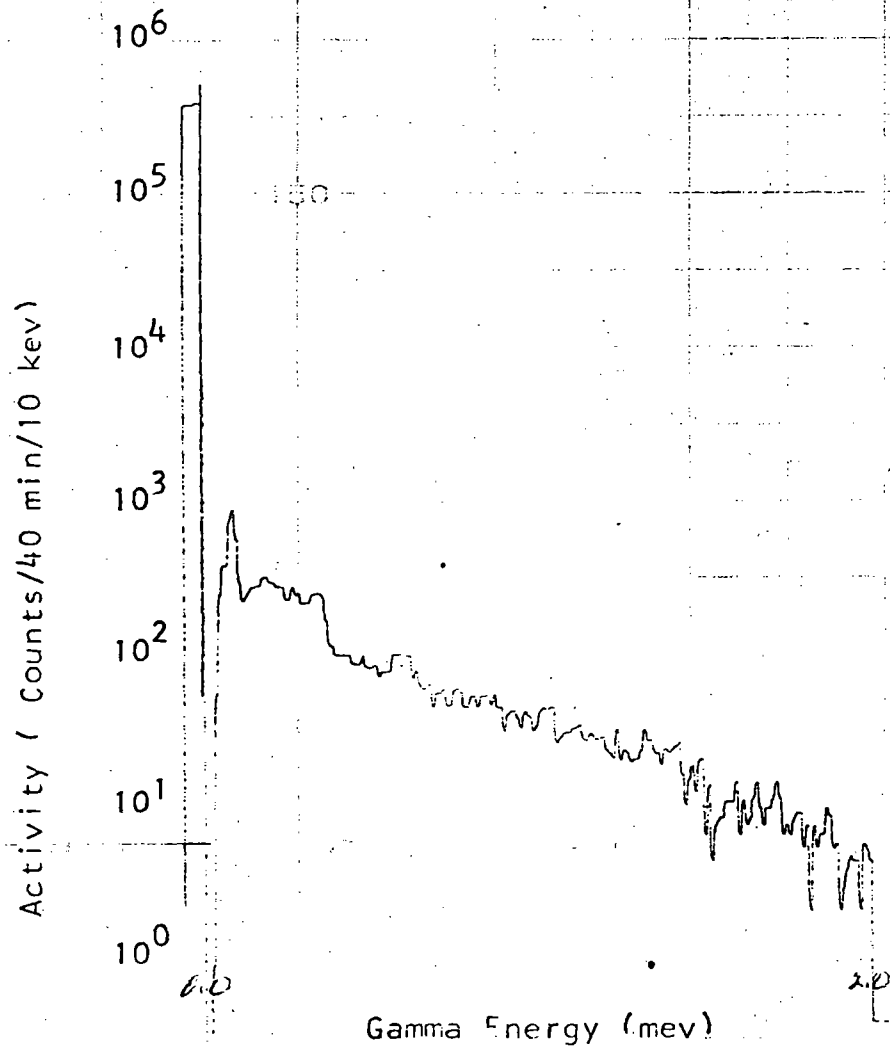
Sooner Dial Company  
Clinton, Oklahoma

Wipe No.2

Live Time: 40 min

Background not subtracted

Calibration: 10 kev/channel



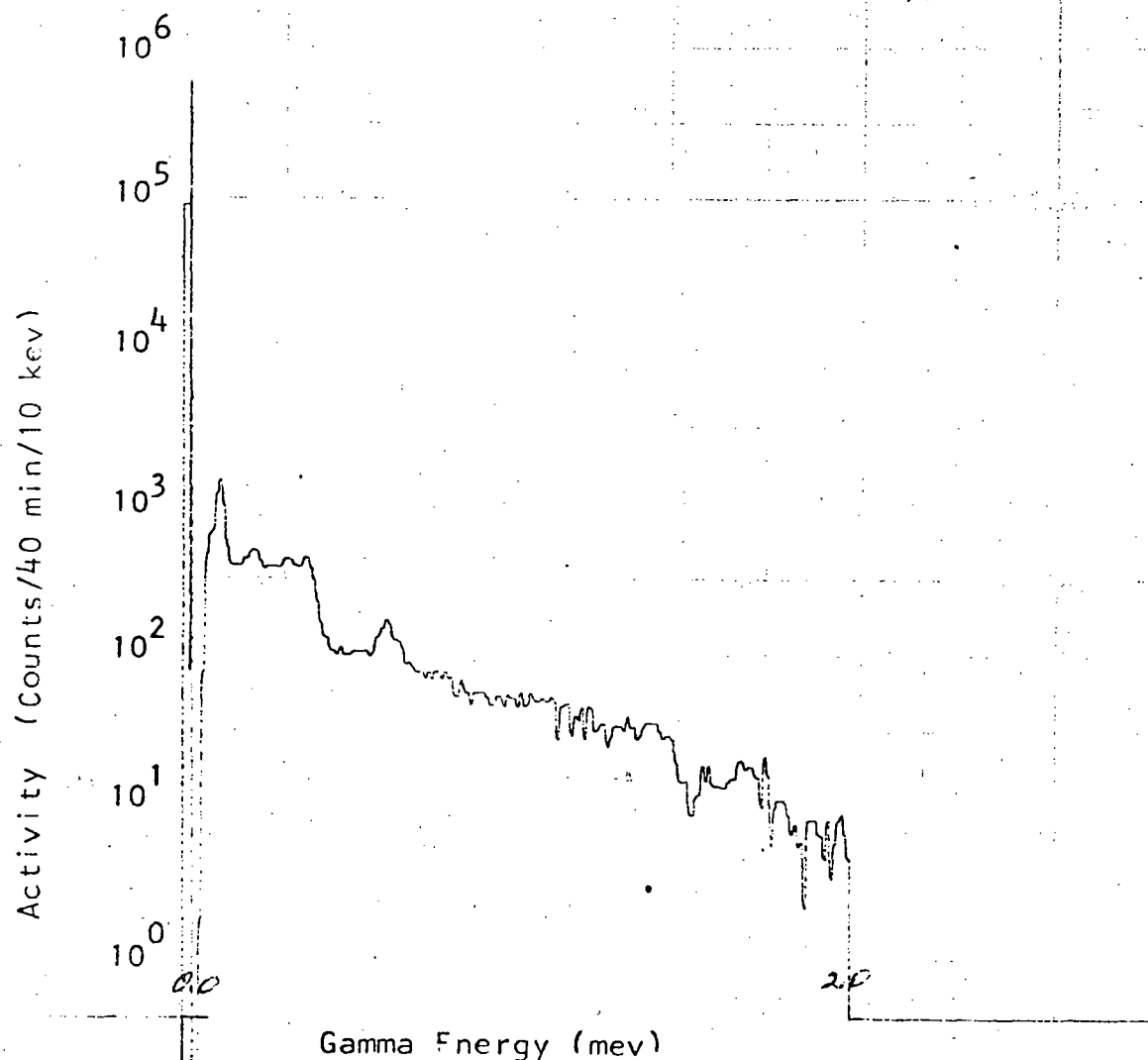
Sooner Nail Company  
Clinton, Oklahoma

Wipe No. 3

Live Time: 40 min

Background not subtracted

Calibration: 10 key/channel





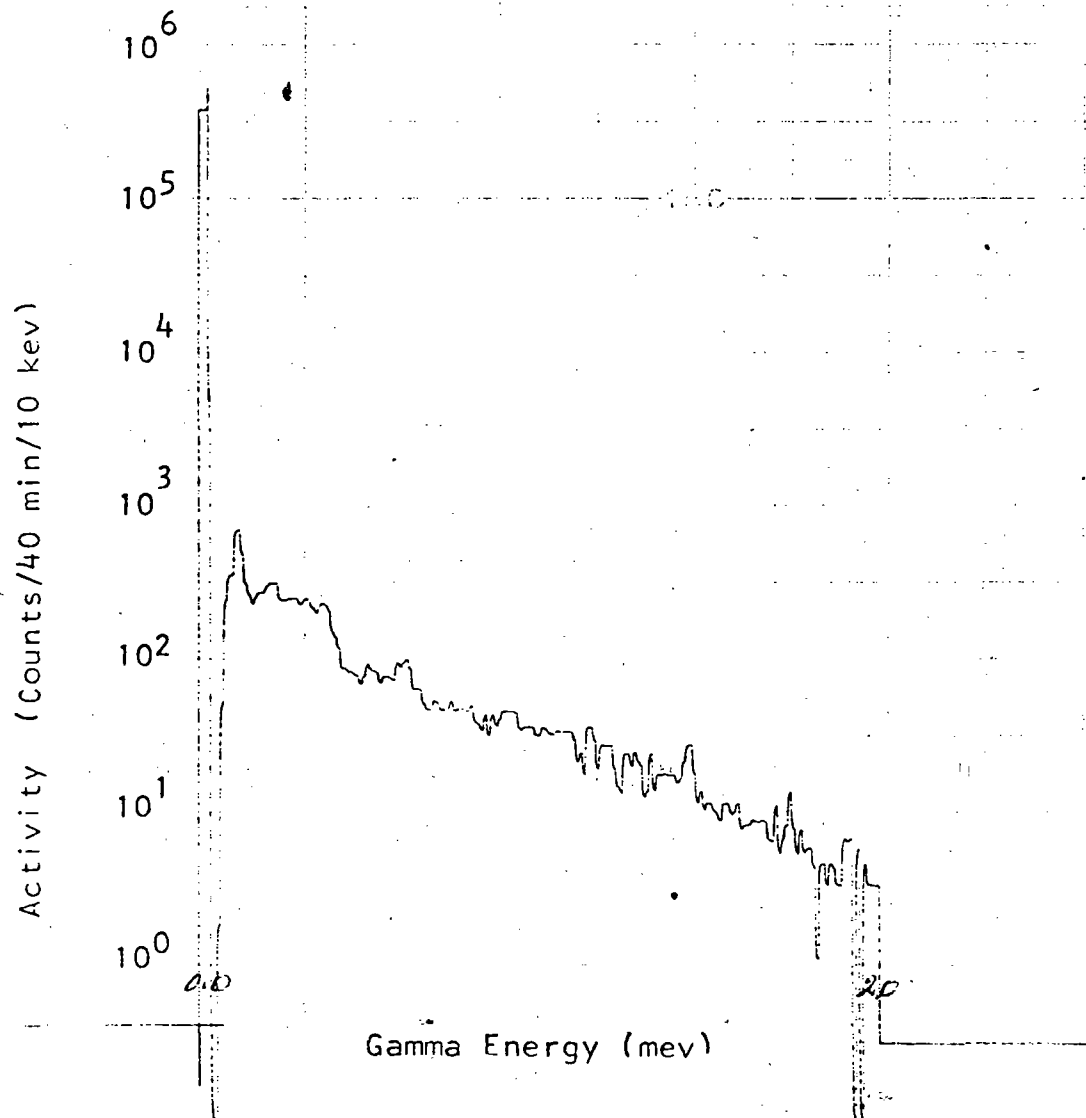
Sooner Dial Company  
Clinton, Oklahoma

Wipe No. 4

Live Time: 40 min.

Background not subtracted

Calibration: 10 kev/channel



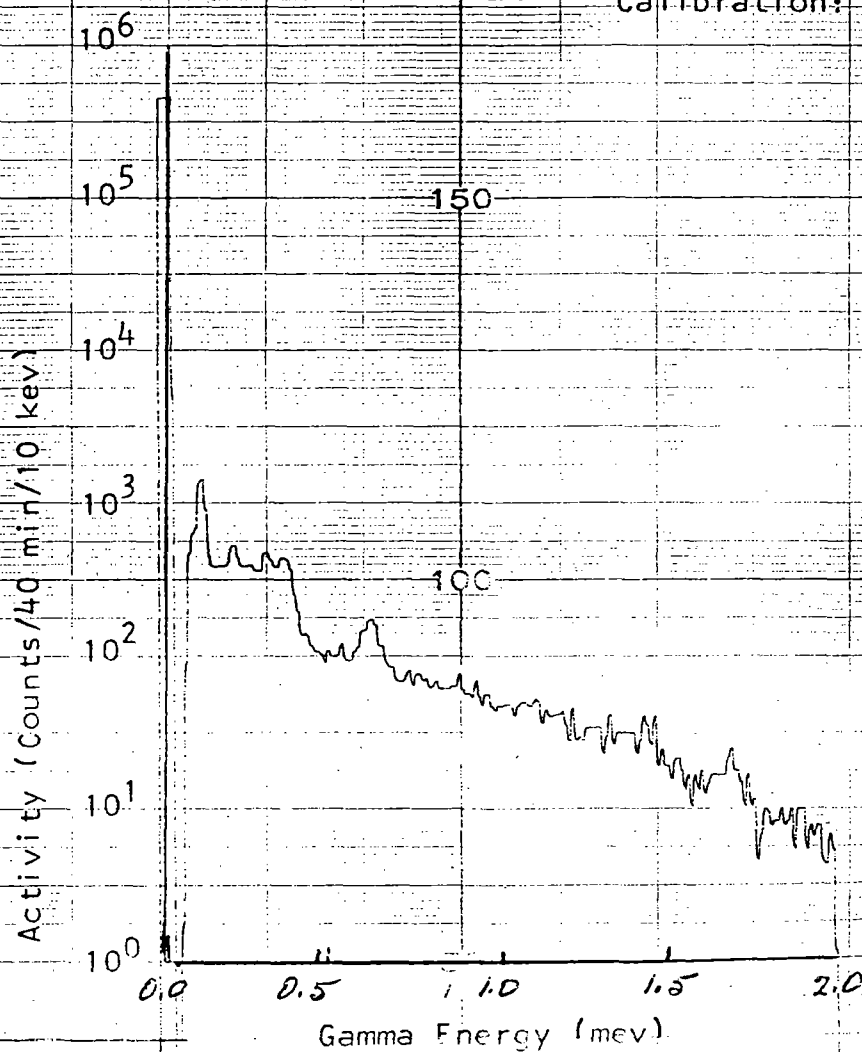
Sooner Dial Company  
Clinton, Oklahoma

Wipe No. 5  
200

Live Time: 40 min.

Background not subtracted

Calibration: 10 kev/channel



Sooner Dial Company  
Clinton, Oklahoma

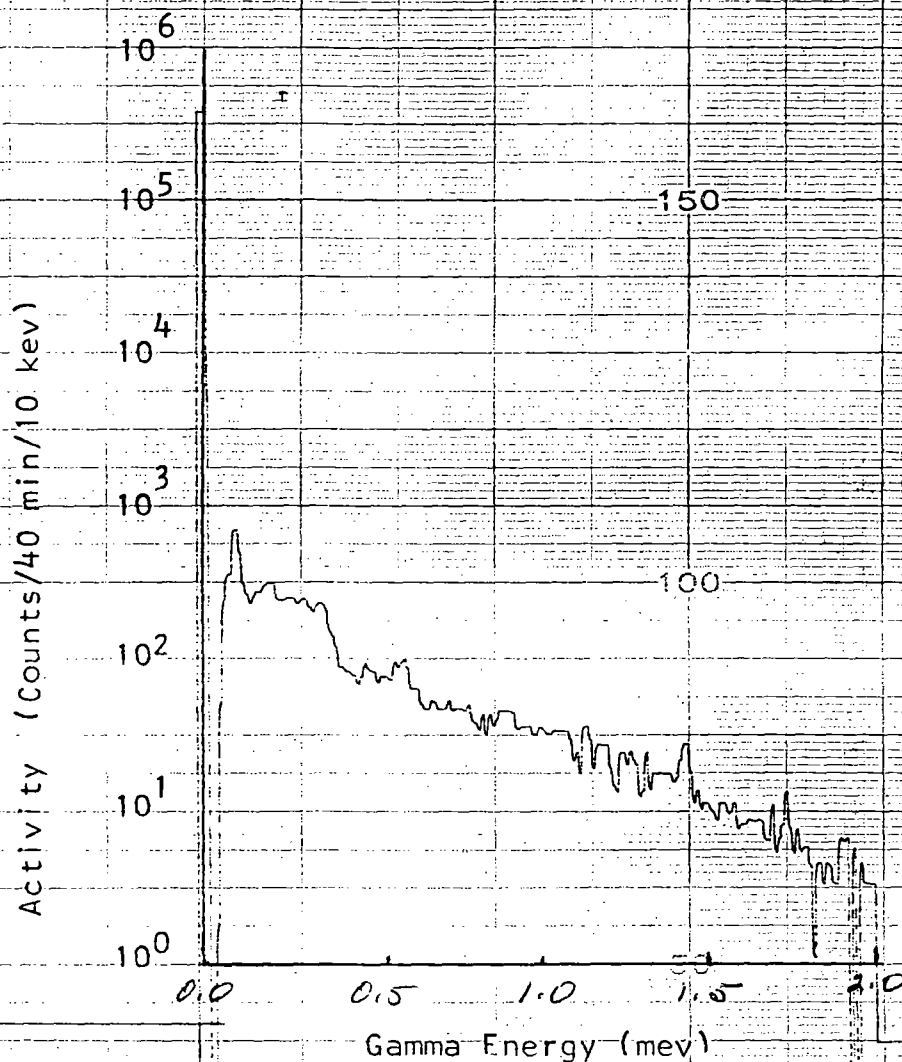
Wipe No. 45

200

Live Time 40 min.

Background not subtracted

Calibration: 10 kev/channel



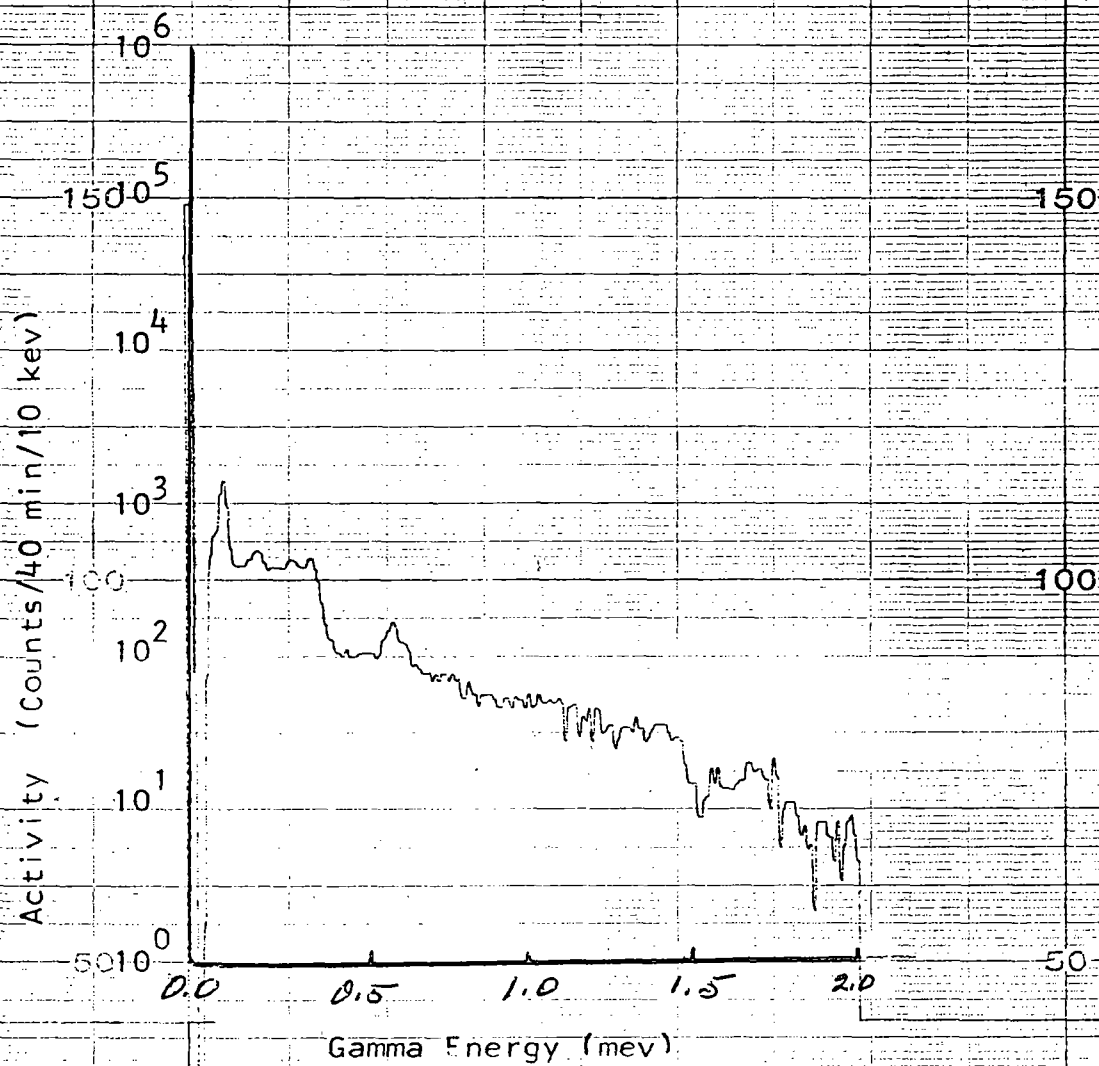
Sooner Dail Company  
Clinton, Oklahoma

Wipe No. 3

Live Time: 40 min

Background not subtracted

Calibration: 10 kev/channel



Sooner Dial Company  
Clinton, Oklahoma

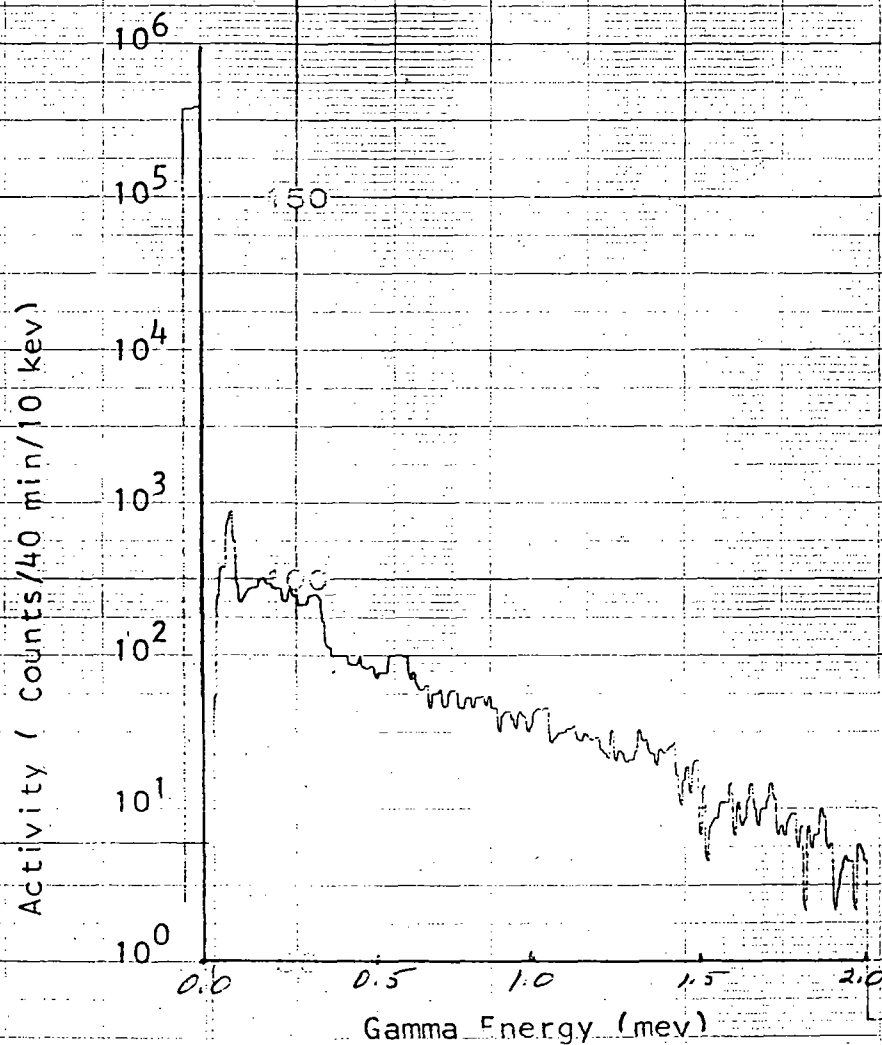
Wipe No. 2

200

Live Time: 40 min

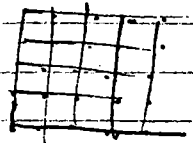
Background not subtracted

Calibration: 10 kev/c



602-944-3060

Johnston vs USA. Fed Court Wichita



1300  
2600

Safety Light Corp  
4150A Old Durick Rd.  
Blomensburg, Pa.

Dinner	\$40.45
Troop	2.80
Barial	<u>12.50</u>

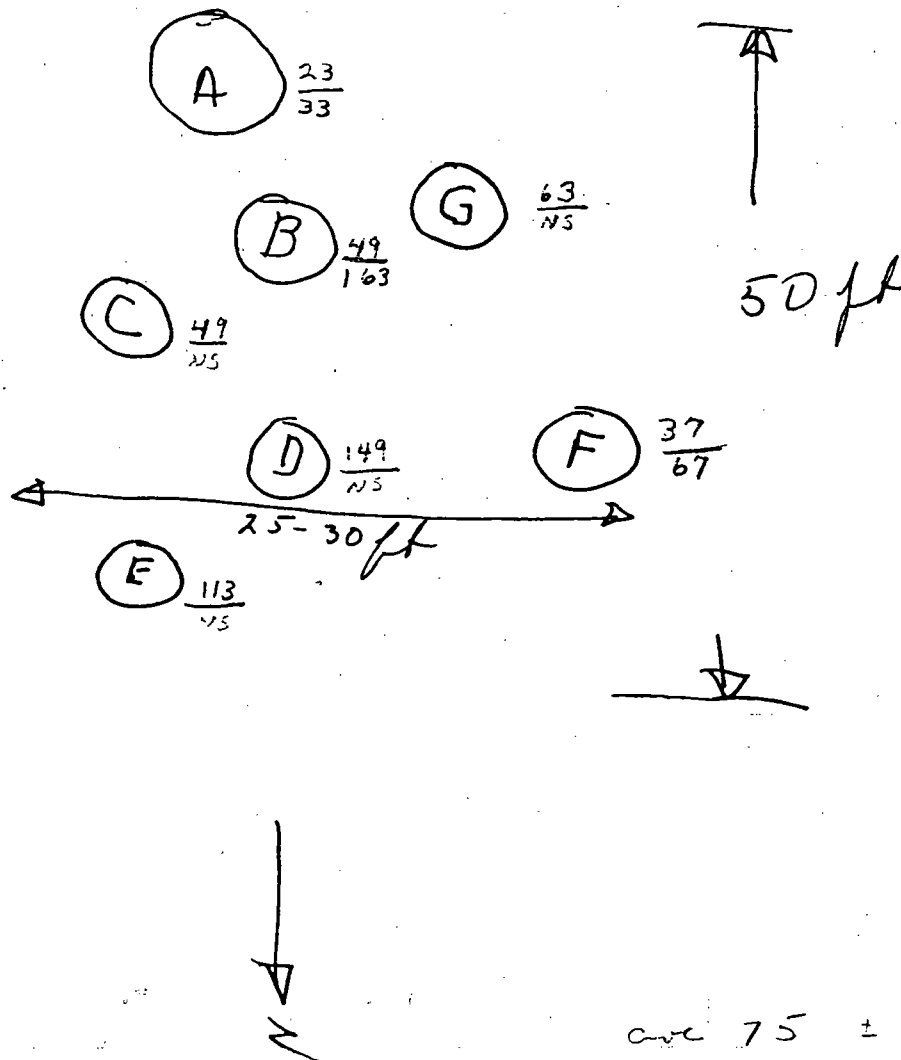
$$\frac{100 \text{ p Ci/gm}}{0.1 \text{ p Ci/gm}} = 1000$$

$$2.3 \text{ gm/ft}^3 \text{ CC}$$

$$2700 \text{ #/yd}^3$$

$$900 \text{ #/ft}^3$$

$$225 \text{ #/ft}^3$$



$$\text{ave } 75 \pm 49$$

$$\frac{15900 \text{ ft}^3}{5}$$

$$2.7 \text{ ft}^3 \text{ 31500}$$

$$1.73 \text{ Acres}$$

$$1500 \text{ ft}^3$$

$$410$$

$$1060 \text{ ft}^3$$

$$40 \text{ yd}$$